

IN THE CLAIMS:

Claim 1 and 18 are amended herein. All pending claims and their present status are produced below.

- 1 1. (Currently Amended) An optical communications system for communicating information
2 comprising:
3 a receiver subsystem comprising:
4 an optical splitter for splitting a composite optical signal having at least two
5 subbands of information and at least one tone into at least two optical
6 signals; and
7 at least two heterodyne receivers, each heterodyne receiver coupled to receive
8 one of the optical signals from the optical splitter for recovering
9 information from one of the subbands contained in the optical signal,
10 each heterodyne receiver comprising:
11 a heterodyne detector for mixing an optical local oscillator signal with
12 the optical signal to produce an electrical signal which includes
13 a frequency down-shifted version of the subband and the tone
14 of the optical signal; and
15 a signal extractor coupled to the heterodyne detector for mixing the
16 frequency down-shifted subband with the frequency down-
17 shifted tone to produce a frequency component containing the
18 information;
19 wherein a signal extractor of one of the at least two heterodyne receivers
20 comprises a bandpass filter, a square law device, and a low pass filter
21 and is configured to square an optical signal containing a tone and a
22 sideband, and wherein a signal extractor of another of the at least two
23 heterodyne receivers comprises two extraction paths and a combiner,
24 each extraction path configured to process a sideband within an
25 electrical signal.

26 2. (Previously Amended) The optical communications system of claim 1 wherein the
27 optical splitter includes a separate splitter for separating each optical signal from the
28 composite signal.

29 3. (Original) The optical communications system of claim 1 wherein the optical
30 splitter includes an optical power splitter for splitting the composite optical signal into optical
31 signals which are substantially the same in spectral shape.

32 4. (Original) The optical communications system of claim 1 wherein the optical
33 splitter includes a wavelength division demultiplexer for wavelength division demultiplexing
34 the composite optical signal into the optical signals.

35 5. (Original) The optical communications system of claim 1 wherein the optical
36 splitter includes a wavelength-selective optical power splitter for splitting the composite
37 optical signal into optical signals, each optical signal including a different primary subband
38 and attenuated other subbands.

39 6. (Original) The optical communications system of claim 1 wherein:
40 the electrical signal further comprises direct detection components; and
41 the frequency down-shifted version of the subband does not spectrally overlap with
42 the direct detection components.

43 7. (Original) The optical communications system of claim 1 wherein the heterodyne
44 detector comprises:

45 an optical combiner for combining the optical local oscillator signal and the optical
46 signal; and

47 a square law detector disposed to receive the combined optical local oscillator signal
48 and optical signal.

49 8. (Original) The optical communications system of claim 1 further comprising:
50 an optical wavelength filter coupled between the optical splitter and one of the
51 heterodyne receivers.

52 9. (Original) The optical communications system of claim 1 wherein the tone for
53 each optical signal is located at an optical carrier frequency for the corresponding subband.

54 10. (Original) The optical communications system of claim 1 wherein the tone for
55 each optical signal includes a pilot tone located at a frequency other than at an optical carrier
56 frequency for the corresponding subband.

57 11. (Original) The optical communications system of claim 1 wherein at least two
58 optical signals have tones at the same frequency.

59 12. (Original) The optical communications system of claim 1 wherein the frequency
60 component includes a difference component.

61 13. (Original) The optical communications system of claim 1 wherein the receiver
62 subsystem further comprises:

63 at least two FDM demultiplexers, each FDM demultiplexer coupled to receive the
64 frequency component from one of the heterodyne receivers for FDM
65 demultiplexing the frequency component into a plurality of electrical low-
66 speed channels.

67 14. (Original) The optical communications system of claim 13 wherein the receiver
68 subsystem further comprises:

69 at least two QAM demodulation stages, each QAM demodulation stage coupled to
70 one of the FDM demultiplexers for QAM demodulating the electrical low-
71 speed channels.

72 15. (Original) The optical communications system of claim 1 further comprising:
73 a transmitter subsystem for generating the composite optical signal.

74 16. (Original) The optical communications system of claim 15 wherein the
75 transmitter subsystem comprises:

76 at least two transmitters, each for generating one of the subbands, each transmitter
77 using a different optical carrier frequency; and

78 an optical combiner coupled to the transmitters for optically combining the subbands
79 into the composite optical signal.

80 17. (Original) The optical communications system of claim 15 wherein the
81 transmitter subsystem comprises:
82 at least two electrical transmitters for generating electrical channels;
83 an FDM multiplexer coupled to the electrical transmitters for FDM multiplexing the
84 electrical channels into an electrical high-speed channel, the electrical high-
85 speed channel further including the tones; and
86 an E/O converter coupled to the FDM multiplexer for converting the electrical high-
87 speed channel into the composite optical signal.

88 18. (Currently Amended) A method for recovering information from a composite
89 optical signal containing the information, the method comprising:
90 receiving a composite optical signal having at least two subbands of information and
91 at least one tone;
92 splitting the composite optical signal into at least two optical signals; and
93 for each optical signal:
94 receiving a signal from an optical local oscillator;
95 detecting the optical signal using heterodyne detection and the optical local
96 oscillator to produce an electrical signal which includes a frequency
97 down-shifted version of one of the subbands and the tone of the optical
98 signal; and
99 mixing the frequency down-shifted subband with the frequency down-shifted
100 tone to produce a frequency component containing the information,
101 wherein the step of mixing comprises one of: mixing by a signal
102 extractor comprising a bandpass filter, a square law device, and a low
103 pass filter configured to square an optical signal containing a tone and
104 a sideband and mixing by a signal extractor comprising two extraction
105 paths and a combiner, each extraction path configured to process a
106 sideband within an electrical signal.

107 19. (Original) The method of claim 18 wherein the step of splitting the composite
108 optical signal into at least two optical signals includes separating each optical signal from the
109 composite optical signal.

110 20. (Original) The method of claim 18 wherein the step of splitting the composite
111 optical signal into at least two optical signals includes splitting the composite optical signal
112 into optical signals which are substantially the same in spectral shape.

113 21. (Original) The method of claim 18 wherein the step of splitting the composite
114 optical signal into at least two optical signals includes wavelength division demultiplexing
115 the composite optical signal into the optical signals.

116 22. (Original) The method of claim 18 wherein the step of splitting the composite
117 optical signal into at least two optical signals includes wavelength selectively splitting the
118 composite optical signal into optical signals, each optical signal including a different primary
119 subband and attenuated other subbands.

120 23. (Original) The method of claim 18 wherein the step of detecting the optical signal
121 using heterodyne detection and the optical local oscillator comprises:
122 optically combining the optical local oscillator signal and the optical signal; and
123 detecting the combined optical local oscillator signal and optical signal using square
124 law detection.

125 24. (Original) The method of claim 18 wherein the tone for each optical signal is
126 located at an optical carrier frequency for the corresponding subband.

127 25. (Original) The method of claim 18 wherein the tone for each optical signal
128 includes a pilot tone located at a frequency other than an optical carrier frequency for the
129 corresponding subband.

130 26. (Original) The method of claim 18 further comprising, for each optical signal:

131 FDM demultiplexing the frequency component into a plurality of electrical low-speed
132 channels.

133 27. (Original) The method of claim 26 further comprising, for each optical signal:
134 QAM demodulating the electrical low-speed channels.

135 28. (Original) The method of claim 18 further comprising:
136 encoding the information in a composite optical signal; and
137 transmitting the composite optical signal across an optical fiber.

138 29. (Original) The method of claim 28 wherein the step of encoding the information
139 in a composite optical signal comprises:
140 encoding the information onto subbands, each subband located at a different optical
141 carrier frequency; and
142 optically combining the subbands to produce the composite optical signal.

143 30. (Original) The method of claim 28 wherein the step of encoding the information
144 in a composite optical signal comprises:
145 generating electrical channels;
146 FDM multiplexing the electrical channels into an electrical high-speed channel, the
147 electrical high-speed channel further including the tones; and
148 converting the electrical high-speed channel from electrical to optical form to produce
149 the composite optical signal.

150 31. (Original) The method of claim 28 wherein the step of encoding the information
151 in a composite optical signal comprises:
152 receiving an optical carrier; and
153 modulating the optical carrier with the information using a raised cosine modulation
154 biased at a point substantially around a V_{π} point.